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## Multinodular Gastric Leiomyoma with Laparoscopic Minimized Resection Based on a Determination by Endoscope: A Case Report

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**Background:** Gastric leiomyomas are usually solitary, rounded, and demarcated masses, and multiple leiomyomas (more than three) are extremely rare. We report a case of a 30-year-old woman who was referred to our hospital for further treatment of an enlarging gastric submucosal tumour (SMT).

**Case Presentation:** She underwent laparoscopic gastric partial resection with oesophagogastroduodenoscopy (OGD), which revealed a multinodular gastric SMT (10 cm in diameter) located in the upper body of the stomach. Endoscopic ultrasonography (EUS) revealed a hypoechoic mass located in the fourth layer and multiple nodules approximately 1 cm in diameter. We subsequently performed EUS-guided fine-needle aspiration biopsy. The patient underwent laparoscopic gastric partial resection with EGD. Because the tumour was extensive on the lesser curvature of the stomach and was located near the oesophagogastric junction, we preserved the gastric function with minimal resection of the stomach. No intraoperative or postoperative complications were observed. The tumour was pathologically diagnosed as gastric leiomyoma. Laparoscopic minimized resection used by endoscope, can avoid gastric deformity and preserve gastric function, especially when the gastric SMTs are located near the oesophagogastric junction.

**Conclusion:** Laparoscopic gastric partial resection with EGD is an effective treatment option for complete resection of extensive gastric SMT.

**Key Words:** leiomyoma, multinodular type, laparoscopic gastric partial resection

### Introduction

Gastric leiomyomas represent rare gastric neoplasms, and the tumours are usually solitary, rounded, and demarcated masses, and multiple leiomyomas (more than three) are extremely rare. We reported a case of multinodular

gastric leiomyoma located at the oesophagogastric junction with unusual shape and peculiar image findings reported, and the tumours that was successfully treated by laparoscopic gastric partial resection with oesophagogastroduodenoscopy (OGD).

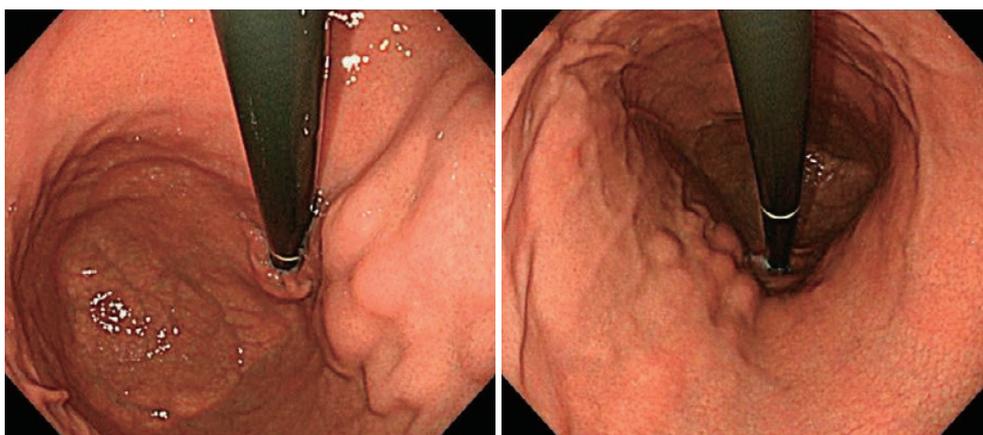
We report a case of multinodular gastric leiomyoma

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**Figure 1** Endoscopic findings showing intraluminal growth type of a 10 cm multinodular gastric submucosal tumour at the lesser curvature of the proximal stomach.



**Figure 2** Endoscopic ultrasound showing a hypoechoic lesion in the fourth layer and multiple nodules from about 1 cm in diameter and connected with each other in the upper body of the stomach.

that was successfully treated by laparoscopic gastric partial resection with OGD.

### Case Report

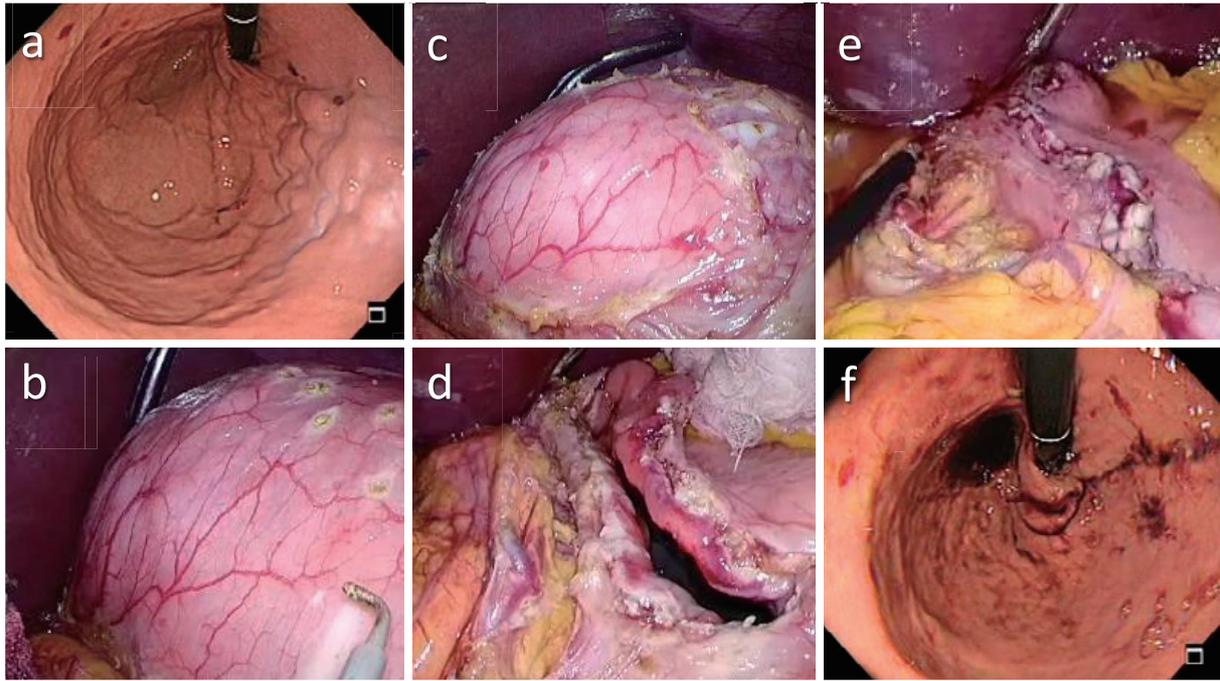
The patient was a 30-year-old woman who was referred to our hospital for further treatment of an enlarging gastric submucosal tumour (SMT). All haematological values were within normal ranges.

OGD revealed a multinodular SMT that was 10 cm in diameter and situated on the wall of the upper body of the lesser curvature of the stomach (**Figure 1**). Endoscopic ultrasonography (EUS) revealed a hypoechoic mass located in the fourth layer; multiple nodules of about 1 cm in diameter and connected with each other were palpable in the upper body of the stomach (**Figure 2**). We subsequently performed EUS-guided fine-needle aspiration (EUS-FNA) biopsy. Cytological examination of samples obtained by EUS-FNA showed spindle-shaped cells. An adequate histologic sample was

obtained; immunohistologic examination showed positive smooth muscle actin (SMA) and desmin and negative c-kit, CD34, and S-100 protein. We diagnosed the patient with gastric leiomyoma. Based on the size of the gastric leiomyoma (10 cm in diameter) and its multinodular type, we considered the possibility of malignancy of the tumour. The tumour required resection without lymphadenectomy. The gross tumour occupied half of the lesser curvature line, which conventionally requires proximal gastrectomy; however, such type of surgery is associated with reduced quality of life. We wanted to retain the gastric function with minimal resection of the stomach, and thus, we performed laparoscopic gastric partial resection with OGD.

### Treatment course

After inducing general anaesthesia, five ports were inserted into the peritoneal cavity, as required for gastrectomy. Blood vessels in the lesser curvature of the stomach to the tumour excision area were prepared on the laparoscopic side using an ultrasonically activated device (**Figure 3**). However, we were unable to detect the tumour on OGD because the tumour was a small nodule and it was an intramural tumour of the stomach. Through serosal markings visualised by a laparoscope, the edge of the tumour was detected by the transmitted light of the endoscope (**Figure 3a and 3b**). Then, sodium hyaluronate solution containing indigo carmine dye was injected into the submucosal layer circumferentially by the endoscope. A circumferential seromuscular incision was performed laparoscopically around the serosal markings



**Figure 3** Laparoscopic-endoscopic cooperative surgery procedure: operation findings. (a) We checked the edge of the tumour as detected by the transmitted light of the endoscope. (b) After preparation of blood vessels, we confirmed by serosal markings via laparoscope under endoscopic light navigation. (c) A circumferential seromuscular incision was performed laparoscopically around the serosal markings. (d) Complete resection of the tumour by laparoscopic procedure. (e) Closure of the defect in the gastric wall was performed through laparoscopic hand-suturing technique. (f) We confirmed the absence of deformation or leakage along the gastric wall using an endoscope.

with a minimum margin hook knife and an ultrasonically activated device (**Figure 3c**). A full-thickness resection was made laparoscopically using an ultrasonically activated device (**Figure 3d**). An en bloc-resected specimen was removed via the abdominal cavity using Endobag™ (Covidien, Dublin, Ireland). The defect of the gastric wall was continuously sutured using V-loc™ (Covidien, Dublin, Ireland) to the minor axis in an all-layer fashion with the laparoscopic hand-suturing technique (**Figure 3e**). After resection of the tumour with a minimal margin, no deformation or leakage was visualised along the gastric wall. After completing the full-thickness closure, the endoscope was inserted into the stomach to confirm that it passed the suture site easily and that no air leakage had occurred despite insufflations of the stomach, and a drain was placed on the suture line of the lesser curvature (**Figure 3f**). The total operation time was 221 minutes.

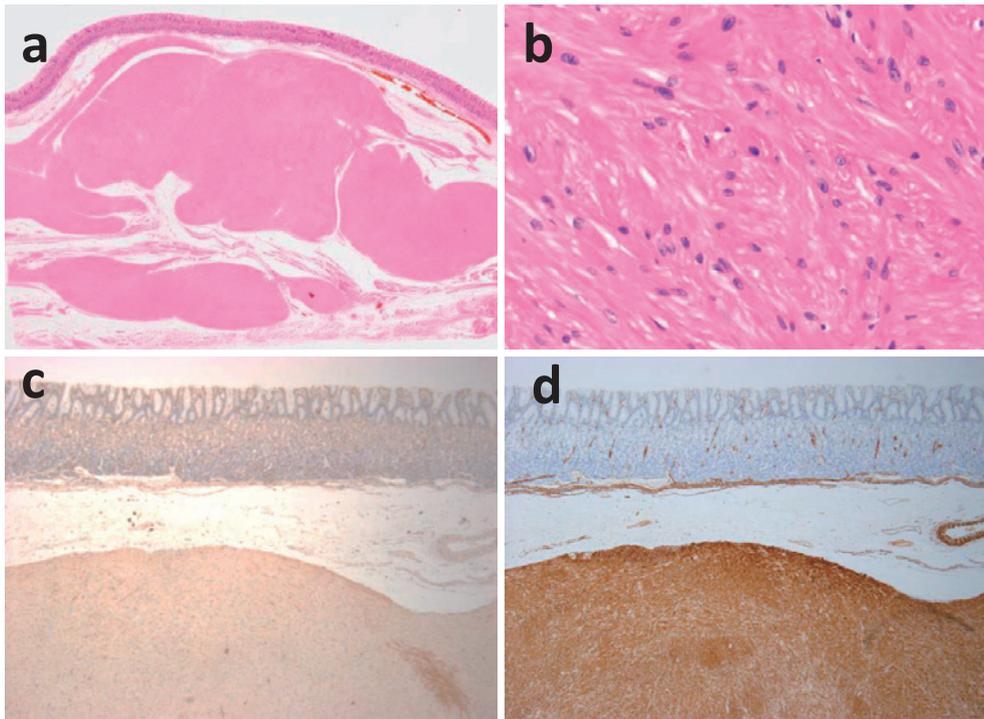
## Results

Macroscopically, a cross-sectional specimen of the tumour consisted of multiple white nodules and the tumour was  $8.8 \times 4.7$  cm. Pathological examination confirmed that the tumour was located mainly in the submucosa and consisted of fascicles of spindle-shaped cells. Immunohistochemical findings showed positive SMA and desmin along with negative findings for c-kit, CD34, and S-100 protein and nearly  $<0\%$  Ki-67, thus indicating a diagnosis of leiomyoma (**Figure 4**).

The patient had an uneventful postoperative course, and was well and asymptomatic 2 years after the surgery.

## Discussion

Gastric leiomyomas represent approximately 2.5% of gastric neoplasms, and it most commonly manifests between 50 and 59 years of age.<sup>1</sup> In most cases, there are no specific symptoms or clinical signs of gastric leiomyoma. This tumour is detected incidentally during OGD for can-



**Figure 4** Microscopic findings of the resected tumours. Haematoxylin and eosin (HE) staining showed that the tumour was located in the submucosal layer, that is, the muscularis propria (a) and funicular spindle cell proliferation ( $\times 400$ ) (b). Immunohistochemistry revealed the expression of smooth muscle actin ( $\times 40$ ) (c) and non-expression of S-100 ( $\times 40$ ) (d).

cer screening or endoscopy. When symptoms are present, bleeding and abdominal discomfort are most frequent.

Leiomyomas are usually solitary, rounded, and demarcated masses, and multiple leiomyomas (more than three) are extremely rare. The presence of multiple tumours in this case was a possible indication of a malignant phenotype. Therefore, the patient underwent tumour resection. Multinodular leiomyomas are reported as oesophageal leiomyomatosis,<sup>2</sup> an extremely rare condition, which is associated with Alport syndrome, a genetic type of glomerular nephritis associated with sensorineural hearing loss and ocular lesions.<sup>3</sup> This is a very rare condition, and only one similar case has been published before.<sup>4</sup> Similar to our case, in this case too, many small nodules were removed and the size of the tumour was 8 cm. When such a tumour has poor protuberance, it is difficult to judge the boundary with a normal gastric wall, and the area of resection may increase. Gastric leiomyoma is benign, and the frequency of lymph node involvement is low; hence, lymphadenectomy is not generally required. Therefore, complete resection with negative surgical margins is possible.

The treatment strategy for stomach leiomyoma remains controversial. Wedge resection is adequate for gastric leiomyoma, with no need for gastrectomy and systematic lymph node dissection. According to Sasako et al,<sup>5</sup> surgery is indicated for gastric leiomyoma with tumours larger than 3 cm, with rapid growth, with inhomogeneous ultrasound pattern, or with ulceration. In this case, based on the tumour size and the multinodular type, surgery was indicated.

Laparoscopic wedge resection of the stomach is performed for resection of stomach tumours.<sup>6</sup> However, a surgical approach from the outside of the stomach is sometimes difficult in gastric SMTs with intraluminal or intramural growth because of difficulty in identification of the tumours, and an unintentionally large resection may result in deformity of the remaining stomach and gastric malfunction, as mentioned above. In our case, we could avoid conventional proximal gastrectomy because we minimised gastric wall resection by using OGD; moreover, we selected the hand-suturing technique to close the large defect in the stomach to avoid gastric deformity and oesophageal stenosis after surgery.<sup>7-9</sup> We

consider that the hand-suturing technique makes it possible to select the best anastomotic axis to avoid transformation of the stomach. The procedure was used to ensure radical cure and maintain the patients' health-related quality of life.<sup>10</sup>

### Conclusion

We report a case of leiomyoma with unusual shape and peculiar imaging findings.

**Consent for Publication:** Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

**Conflicts of Interest:** The authors indicated no conflicts of interest.

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